

ASTRONOMY AND ASTROPHYSICS

A European Journal

Volume 42 1975

**Published by Springer-Verlag Berlin · Heidelberg · New York
on behalf of the Board of Directors**

Astronomy and Astrophysics

A European Journal

Board of Directors

Chairman: A. Blaauw (ESO)
Y. Andrillat (France)
L. Biermann (Germany)
H. G. van Buren (The Netherlands)
G. Contopoulos (Greece)
R. A. J. Coutrez (Belgique)
H. C. van de Hulst (The Netherlands)
R. Kippenhahn (Germany)
J. Kovalevsky (France)

G. Larsson-Leander (Sweden)
W. Priester (Germany)
A. Reiz (Denmark)
L. Rosino (Italy)
E. Schatzman (France)
G. Setti (Italy)
J. L. Steinberg (France)
U. Steinlin (Switzerland)
G. Traving (Germany)

Editors-in-Chief

J. Heidmann
Observatoire de Meudon
92190 Meudon (France)

H. H. Voigt
Universitätssternwarte
Geismarlandstr. 11
3400 Göttingen (Germany)

Editing Secretaries

Mrs. F. Axissa
Miss B. Perche

Mrs. B. Krebs

Board of Editors

K. Bahner (Heidelberg)
J. E. Baldwin (Cambridge)
B. Baschek (Heidelberg)
W. Becker (Basel)
E. J. Blum (Meudon)
K. H. Böhm (Seattle)
J. Borgman (Rodan)
E. M. Burbidge (Hailsham)
O. J. Eggen (Woden)
W. Fricke (Heidelberg)
V. L. Ginzburg (Moscow)
M. Hénon (Nice)
J. T. Jefferies (Honolulu)

F. D. Kahn (Manchester)
F. J. Kerr (Maryland)
K. O. Kiepenheuer (Freiburg)
H. van der Laan (Leiden)
P. Ledoux (Liège)
J. Lequeux (Meudon)
P. O. Lindblad (Stockholm)
L. Mestel (Manchester)
P. G. Mezger (Bonn)
B. Morando (Paris)
F. Pacini (Frascati)
B. E. J. Pagel (Hailsham)
L. Plaut (Groningen)

F. Praderie (Meudon)
M. S. Roberts (Green Bank)
M. Schmidt (Pasadena)
F. Spite (Meudon)
A.B.Underhill (Goddard Space Flight Center)
H. Van Regemorter (Meudon)
L. Woltjer (Hamburg)
J. P. Zahn (Nice)
Ya. B. Zeldovich (Moscow)
C. Zwaan (Utrecht)

The exclusive copyright © for all languages and countries, including the right for photomechanical and any other reproduction, also in microform, is vested in European Southern Observatory (ESO).
The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Springer-Verlag · Berlin · Heidelberg · New York
Printed in Germany
Printers: Brühlsche Universitätsdruckerei, Giessen

Volume 42 1975

Contents

Stars and Stellar Evolution

| | |
|--|-----|
| LIVIO, M., SHAVIV, G.: On the Light Curve of HZ Herculis | 17 |
| HEARD, J.F., HURKENS, R., HARMANEC, P., KOUBSKÝ, P., KRPATA, J.: Properties and Nature of Shell Stars. 5. Re-determination of the Velocity Curve of 4 Her | 47 |
| ARNOULD, M., NØRGAARD, H.: The Explosive Thermonuclear Formation of ^7Li and ^{11}B | 55 |
| DE GRÈVE, J.-P., DE LOORE, C.: Period Changes in Binary Systems during the Wolf-Rayet Stage | 91 |
| D'ANTONA, F., MAZZITELLI, I.: White Dwarf External Layers. II. Convection and Magnetic Fields | 127 |
| (RN) HECK, A.: Relations between Luminosity, Period and Metallicity in RR Lyrae Stars | 131 |
| (RN) WALTER, K.: A Precessional Period in U Cephei? | 135 |
| (RN) STALLER, R.F.A.: Low-velocity M -dwarfs Explained by Very Low-mass Stars | 155 |
| (LE) DOAZAN, V., BRIOT, D., BOURDONNEAU, B.: New Absorbing Envelope of 59 Cygni | 161 |
| D'ANTONA, F., MAZZITELLI, I.: White Dwarf External Layers. I. Convection and Central Temperatures | 165 |
| SÖDERHJELM, S.: The Three-body Problem and Eclipsing Binaries. Application to Algol and λ Tauri | 229 |
| NEVO, I., SADEH, D., FROHLICH, A.: A Search for Optical Pulsations from Single Line Spectroscopic Binaries | 247 |
| HAVNES, O., MOE, O.K.: Line Profiles and Magnetic Intensification in Magnetic Stars | 269 |
| GYLDENKERNE, K., JØRGENSEN, H.E., CARSTENSEN, E.: Four-colour Photometry of Eclipsing Binaries. I. HS Hya, Light Curves, Photometric Elements, and Determination of Helium Content | 303 |
| QUERCI, M., QUERCI, F.: The Infrared Spectrum of the Carbon Stars UU Aur and YCVn from 4000 to 6800 cm^{-1} | 329 |
| NECKEL, H.: The Distribution of Masses, Ages and Luminosities of Population I Field Giants | 379 |
| HESSBERG, H., NIEKERKE, J., STEPHAN, K.-H.: Absolute Rocket Photometry of γ -Ori in the VUV-region | 395 |
| GUSTAFSSON, B., BELL, R.A., ERIKSSON, K., NORDLUND, Å.: A Grid of Model Atmospheres for Metal-deficient Giant Stars I | 407 |
| (RN) VAN DIEST, H.: On the Computation of Minimum Times of Light Curves | 465 |
| (RN) MAEDER, A.: Evidence for a Rotational Reddening in Early B-type Stars | 471 |

Galactic Structure, Stellar Dynamics, Interstellar Matter

| | |
|--|-----|
| KAZÈS, I., LE SQUÉREN, A.M., GADÉA, F.: Radio Observations of Small Galactic Nebulae | 9 |
| LAZAREFF, B.: Neutral Hydrogen Absorption Spectra | 25 |
| STIX, M.: The Galactic Dynamo | 85 |
| WOLTJER, L.: The Galactic Halo: Globular Clusters | 109 |
| (RN) PANAGIA, N.: On the Determination of the Dust Abundance from Middle Infrared Measurements | 139 |
| (RN) JONES, E.M.: The Age of HB 21 and PSR 2021 + 51 | 147 |

| | |
|--|-----|
| (RN) READHEAD, A.C.S., DUFFETT-SMITH, P.J.: The Scale Height of Interstellar Ionised Hydrogen | 151 |
| WENDKER, H.J., SMITH, L.F., ISRAEL, F.P., HABING, H.J., DICKEL, H.R.: High Resolution Radio and Optical Observations of NGC 6888 | 173 |
| MEBOLD, U., HILLS, D.L.: The Intercloud HI Gas in the Directions of Cassiopeia A and Cygnus A | 187 |
| MACLEOD, J.M., DOHERTY, L.H., HIGGS, L.A.: An 85 α Recombination Line Survey of NGC 2024 | 195 |
| SCHALÉN, C.: On the Value of $R = A_V/E_{B-V}$ | 251 |
| GEORGELIN, Y.M., LORTEZ-ZUCKERMANN, M.C., MONNET, G.: Interaction of Hot Stars and of the Interstellar Medium. VII. The Rate and Fate of Stellar Ultraviolet Photons | 273 |
| (LE) STROM, R.G., SUTTON, J.: The Radio Structure of 3 C 358, the Remnant of Kepler's Supernova | 299 |
| KUIPER, T.B.H.: Radio Observations of IC 434 | 323 |
| SANDELL, G., MATTILA, K.: Radiation Density and Lifetimes of Molecules in Interstellar Dust Clouds | 357 |
| KRÜGEL, E., MEZGER, P.G.: An Interpretation of the Radio- and IR-spectrum of the Compact H II Regions W 3 (A) and W 3 (OH) | 441 |
| FRICKE, W., TSIOMIS, A.: Galactic Rotation and Local Irregularities Derived from Fundamental Proper Motions and Radial Velocities | 449 |
| (RN) GÓMEZ, A.E., MAYER, F.: Conditions of Persistence for Old Stellar Groups | 341 |
| (RN) KELLMAN, S.A., DURISEN, R.H.: Rotational Interpretation of Recombination Line Widths in the Galactic Nucleus | 467 |
| Galaxies, Cosmology | |
| VÉRON, M.P., VÉRON, P.: Optical Positions of Radio Sources. III. Measurements on the Palomar Sky Survey Prints | 1 |
| BARBON, R., CAPACCIOLI, M.: Photographic Photometry of Bright Galaxies. III. NGC 1023 | 103 |
| GREWING, M., MEBOLD, U.: Detection of a 21 cm Absorption Line against the Suggested Galaxy/QSO Pair NGC 3067/3 C 232 | 119 |
| (RN) VIDAL, N.V.: A Radio Source and Cluster of Galaxies in 3 U 1252-28 | 145 |
| (LE) JONES, E.M.: Suggested Observations of Supernova Remnants in the Large Magellanic Cloud | 159 |
| HUCHTMEIER, W.K., TAMMANN, G.A., WENDKER, H.J.: The Neutral Hydrogen Content of Elliptical Galaxies | 205 |
| BARBON, R., CAPACCIOLI, M.: Photographic Photometry of Bright Galaxies. IV. NGC 2683 | 221 |
| TAFF, L.G.: The Density Distribution in Clusters of Galaxies | 243 |
| (RN) BIANCHINI, A., ROSINO, L.: The Spectrum of the Bright Variable A-1 in M 31 | 289 |
| (RN) LELIÈVRE, G., WLÉRICK, G.: Identification and Photometry of Radiosources of the 3 CR Catalogue. III. The Case of the Source 3 C 303 | 293 |
| FANTI, C., FANTI, R., FICARRA, A., FORMIGGINI, L., GIOVANNINI, G., LARI, C., PADRIELLI, L.: Source Count Analysis for a Homogeneous Sample of Faint Radio Quasars | 365 |
| VAN ALBADA, G.D., SHANE, W.W.: High Resolution Neutral Hydrogen Observations of NGC 4258 | 433 |
| The Sun | |
| CHMIELEWSKI, Y., MÜLLER, E.A., BRAULT, J.W.: The Solar Beryllium Abundance | 37 |
| DAIGNE, G.: Characteristic Pairs of Type III Bursts as the Electromagnetic Response to a Dispersive Stream Exciter | 71 |
| LANDINI, M., MONSIGNORI FOSSI, B.C.: A Loop Model of Active Coronal Regions | 213 |
| EVANS, J.C., RAMSEY, L.W., TESTERMAN, L.: Macroturbulence Broadening of Solar Lines with Implications for Stellar Studies | 237 |
| FLOWER, D.R., NUSSBAUMER, H.: Relative Intensities of Solar Emission Lines of Ions in the Sodium Iso-electronic Sequence | 265 |

Ph
GA
STE
BAL
CAT

Pla
ENC
the
SCH

Cele
SIM
(RN)

Abs
JA
A21-
RIZ
tional
GEY
GEY
CEST
NOR
STA

Abst
ALCA

Errat
BRI

Index

Physical Processes and Astrophysical Plasmas

| | |
|---|-----|
| GAIL, H.-P., KEGEL, W.H., SEDLMAYR, E.: Effects of Turbulent Velocities on Maser Lines | 81 |
| STEWART, J.M.: The Hydrodynamics of Accretion Discs I: Stability | 95 |
| BASKO, M.M., SUNYAEV, R.A.: Radiative Transfer in a Strong Magnetic Field and Accreting X-ray Pulsars | 311 |
| CANNON, C.J., LOPERT, P.B., MAGNAN, C.: Redistribution Perturbations in Radiative Transfer Theory | 347 |

Planetary System

| | |
|--|-----|
| ENCRENAZ, TH., COMBES, M., ZEAU, Y., VAPILLON, L., BEREZNE, J.: A Tentative Identification of C_2H_4 in the Spectrum of Saturn | 355 |
| SCHOLL, H., FROESCHLÉ, C.: Asteroidal Motion at the 5/2, 7/3 and 2/1 Resonances | 457 |

Celestial Mechanics and Astrometry

| | |
|---|-----|
| SIMON, J.L., BRETAGNON, P.: First Order Perturbations of the Four Large Planets | 259 |
| (RN) McCARTHY, D.D.: An Observation of Eros with a Photographic Zenith Tube | 287 |

Abstracts of Articles which will be Published in A. & A. Suppl. 21, No. 2

| | |
|--|-----|
| JAFFE, W.J., PEROLA, G.C.: A Westerbork Survey of Clusters of Galaxies I. 21 cm Observations of A1656, A2147, A2151, A2197 and A2199: Radio Data and Identifications | 163 |
| RIZVANOV, N., ANDRIENKO, D., GHEZLOUN, A., SVETCHNIKOV, M., OURASSINE, L.: Photographic Observations of Mercury's Transit across the Sun Disk on November 10, 1973 | 163 |
| GEYER, E.H., HOFFMANN, M.: A Photometric Study of the RR _s -Star CY Aqr | 163 |
| GEYER, E.H., HOFFMANN, M.: A Two-colour Photometry of the Short Period RR Lyrae Star DY Peg | 163 |
| CESTER, B., PUCILLO, M.: Narrow-band Photometry of 31 and 32 Cyg | 163 |
| NORDSTRÖM, B.: A Spectral Survey of the Southern Milky Way II. O-B5 Stars $l = 237^\circ$ to 281° | 163 |
| STALIO, R., SELVELLI, P.L.: The Ultraviolet Spectra of ϵ Ori, B0 Ia and α Ori, B0.5 Ia | 164 |

Abstract of an Article which will be Published in A. & A. Suppl. 21, No. 3

| | |
|---|-----|
| ALCAINO, G.: Atlas of Star Clusters with Colour Magnitude Diagrams in the Magellanic Clouds | 164 |
|---|-----|

Erratum

| | |
|---|-----|
| BRIOT, D.: Etudes d'étoiles Be. Décréments Balmer | 475 |
|---|-----|

Author-Index

- Alcaino, G. 164
Andrienko, D. 163
Arnould, M. 55

Barbon, R. 103, 221
Basko, M.M. 311
Bell, R.A. 407
Berezne, J. 355
Bianchini, A. 289
Bourdonneau, B. 161
Brault J.W. 37
Bretagnon P. 259
Briot D. 161, 475

Cannon, C.J. 347
Capaccioli, M. 103, 221
Carstensen, E. 303
Cester, B. 163
Chmielewski, Y. 37
Combes, M. 355

Daigne, G. 71
D'Antona, F. 127, 165
De Grève, J.-P. 91
De Loore, C. 91
Dickel, H.R. 173
Doazan, V. 161
Doherty, L.H. 195
Duffett-Smith, P.J. 151
Durisen, R.H. 467

Ercenaz, Th. 355
Eriksson, K. 407
Evans, J.C. 237

Fanti, C. 365
Fanti, R. 365
Ficarra, A. 365
Flower, D.R. 265
Formiggini, L. 365
Fricke, W. 449
Froeschlé, C. 457
Frohlich, A. 247

Gadéa, F. 9
Gail, H.-P. 81
Georgelin, Y.M. 273
Geyer, E.H. 163
Ghezloun, A. 163
Giovannini, G. 365
Gómez, A.E. 341
Grewing, M. 119
Gustafsson, B. 407
Gyldenkerne, K. 303

Habing, H.J. 173
Harmanec, P. 47
Havnes, O. 269
Heard, J.F. 47
Heck, A. 131
Hessberg, H. 395
Higgs, L.A. 195
Hills, D.L. 187
Hoffmann, M. 163
Huchtmeyer, W.K. 205
Hurkens, R. 47

Israel, F.P. 173

Jaffe, W.J. 163
Jones, E.M. 147, 159
Jørgensen, H.E. 303

Kazès, I. 9
Kegel, W.H. 81
Kellman, S.A. 467
Koubský, P. 47
Kuiper, T.B.H. 323
Krpata, J. 47
Krügel, E. 441

Landini, M. 213
Lari, C. 365
Lazareff, B. 25
Lelièvre, G. 293
Le Squérén, A.M. 9
Livio, M. 17
Lopert, P.B. 347
Lortet-Zuckermann, M.C. 273

MacLeod, J.M. 195
Maeder, A. 471
Magnan, C. 347
Mattila, K. 357
Mayer, F. 341
Mazzitelli, I. 127, 165
McCarthy, D.D. 287
Mebold, U. 119, 187
Mezger, P.G. 441
Moe, O.K. 269
Monnet, G. 273
Monsignori Fossi, B.C. 213
Müller, E.A. 37

Neckel, H. 379
Nevo, I. 247
Nickerke, J. 395
Nordlund, Å. 407

Nordström, B. 163
Nørgaard, H. 55
Nussbaumer, H. 265
Ourassine, L. 163
Padrielli, L. 365
Panagia, N. 139
Perola, G.C. 163
Pucillo, M. 163
Querci, F. 329
Querci, M. 329
Ramsey, L.W. 237
Readhead, A.C.S. 151
Rizvanov, N. 163
Rosino, L. 289
Sadeh, D. 247
Sandell, G. 357
Sedlmayr, E. 81
Selvelli, P.L. 164
Schalén, C. 251
Scholl, H. 457
Shane, W.W. 433
Shavit, G. 17
Simon, J.L. 259
Smith, L.F. 173
Söderhjelm, S. 229
Stalio, R. 164
Staller, R.F.A. 155
Stephan, K.-H. 395
Stewart, J.M. 95
Stix, M. 85
Strom, R.G. 299
Sunyaev, R.A. 311
Sutton, J. 299
Svetchnikov, M. 163

Taff, L.G. 243
Tammann, G.A. 205
Testerman, L. 237
Tsioumis, A. 449

Van Albada, G.D. 433
Van Diest, H. 465
Vapillon, L. 355
Véron, M.P. 1
Véron, P. 1
Vidal, N.V. 145
Walter, K. 135
Wendker, H.J. 173, 205
Wlérick, G. 293
Woltjer, L. 109
Zeau, Y. 355

